

IN THE CLAIMS:

Claims 1-9 and 21-58 were previously canceled. Claims 15, 17-20 and 59-65 have been amended herein. All of the pending claims 1 through 66 are presented below. This listing of claims will replace all prior versions and listings of claims in the application. Please enter these claims as amended.

Listing of Claims:

1-9 (canceled)

10. (previously presented) A method for forming a semiconductor device structure comprising:

providing a semiconductor substrate assembly having a surface;
forming a layer of ruthenium relative to a silicon-containing region; and
performing an anneal in an oxidizing atmosphere to form RuSi_xO_y from the layer of ruthenium and the silicon-containing region.

11. (original) The method of claim 10, wherein forming the layer of ruthenium includes depositing the layer of ruthenium by chemical vapor deposition.

12. (original) The method of claim 10, wherein forming the layer of ruthenium includes depositing the layer of ruthenium by atomic layer deposition.

13. (original) The method of claim 12, wherein forming the layer of ruthenium includes depositing three to five monolayers of RuSi_xO_y .

14. (previously presented) The method of claim 10, wherein performing the anneal in an oxidizing atmosphere includes performing an anneal in an atmosphere including an oxidizing gas.

15. (currently amended) The method of claim 10, further including forming at least one additional conductive material over ~~the-a~~ diffusion barrier layer and selecting the at least one additional conductive material from a group of a metal and a conductive metal oxide.

16. (previously presented) The method of claim 10, wherein performing the anneal in an oxidizing atmosphere to form the RuSi_xO_y includes performing an anneal at a temperature in a range of about 400° C to about 1000° C.

17. (currently amended) The method of claim 10, wherein performing the anneal in an oxidizing atmosphere to form RuSi_xO_y from the layer of ruthenium and the silicon-containing region comprises performing ~~said~~the anneal in an atmosphere comprising air, oxygen, and oxygen-containing compounds.

18. (currently amended) The method of claim 10, wherein ~~said~~the silicon-containing region includes at least a portion of ~~said~~the semiconductor substrate assembly.

19. (currently amended) The method of claim 10, wherein ~~said~~the RuSi_xO_y is deposited in an oxidizing atmosphere.

20. (currently amended) The method of claim 10, wherein ~~said~~the RuSi_xO_y is deposited in an atmosphere including an oxidizing gas.

21-58 (canceled)

59. (currently amended) A method for forming a semiconductor device structure having a RuSi_xO_y barrier layer, the method comprising:

- (a) placing a semiconductor substrate assembly in a reaction chamber, saidthe semiconductor substrate assembly having a surface;
- (b) introducing a ruthenium precursor into saidthe reaction chamber to form a single layer of ruthenium on at least a portion of saidthe semiconductor substrate assembly surface;
- (c) introducing a nonreactive gas into saidthe reaction chamber to substantially cover saidthe single layer of ruthenium and purge saidthe ruthenium precursor from saidthe reaction chamber;
- (d) introducing a silicon precursor into saidthe reaction chamber to form a single layer of RuSi_xO_y on at least a portion of saidthe semiconductor substrate assembly surface; and
- (e) introducing a nonreactive gas into saidthe reaction chamber to substantially cover saidthe single layer of RuSi_xO_y and purge saidthe silicon precursor from saidthe reaction chamber.

60. (currently amended) The method of claim 59, further comprising introducing an oxygen-containing substance into saidthe reaction chamber to form a single barrier layer of RuSi_xO_y on the at least a portion of saidthe semiconductor substrate assembly surface.

61. (currently amended) The method of claim 59, wherein saidthe introducing saidthe silicon precursor into saidthe reaction chamber comprises introducing saidthe silicon precursor in an oxidizing atmosphere within saidthe reaction chamber.

62. (currently amended) The method of claim 61, wherein saidthe introducing saidthe silicon precursor in an oxidizing atmosphere comprises introducing saidthe silicon precursor in an atmosphere comprising air, oxygen, or an oxygen-containing compound.

63. (currently amended) The method of claim 59, wherein said the ruthenium precursor comprises C₆H₈Ru(CO)₃.

64. (currently amended) The method of claim 59, wherein said the introducing said the nonreactive gas comprises introducing a nonreactive gas selected from a group consisting of nitrogen, argon, neon, and xenon.

65. (currently amended) The method of claim 59, wherein said the introducing said the silicon precursor comprises introducing silane or disilane into said the reaction chamber.

66. (original) The method of claim 59, wherein steps (a) through (e) are repeated to form 3 to 5 RuSi_xO_y barrier monolayers.